

DELEGATE BOOKLET 1 TASKS

16IAM07 (F2F)

SECTION A 4MA1

Task 1

SAMs Paper 2F Q23 / Paper 4H Q8

Student attempt A

8. Kwo invests HK\$40 000 for 3 years at 2% per year compound interest.
Work out the value of the investment at the end of 3 years.

$$40000 \times 3 = 120000$$

$$2\% \times 120000 = 2400$$

$$40,000 + 2400 = 42,400$$

HK\$.....42,400.....

(Total for Question 8 is 3 marks)

Student attempt B

8. Kwo invests HK\$40 000 for 3 years at 2% per year compound interest.
Work out the value of the investment at the end of 3 years.

$$40000 \times 1.2 \times 1.2 \times 1.2 = 69120$$

HK\$.....69120

(Total for Question 8 is 3 marks)

Student attempt C

8. Kwo invests HK\$40 000 for 3 years at 2% per year compound interest.
Work out the value of the investment at the end of 3 years.

$$\frac{40000}{100} = ? \times 2 = 1 \text{ year} \quad 800$$

$$40000 + 800$$

$$\frac{40800}{100} \times 2 = 2 \text{ year} = 816$$

$$\frac{41616}{100} \times 2 = 832.32$$

HK\$.....832.32

(Total for Question 8 is 3 marks)

Task 2

SAMs Paper 1F Q21a / Paper 3H Q6a

Student attempt A/B/C

5. (a) Factorise fully $18e^3f + 45e^2f^4$

$$\cancel{6e^2f} 3e \quad 3e \cancel{6e^2} (6e^2 + 15ef^3)$$

$$\underline{3ef(6e^2 + 15ef^3)} \quad (2)$$

5. (a) Factorise fully $18e^2f + 45ef^4$

$$3e^2f(6e + 15f^3)$$

$$\underline{3e^2f(6e + 15f^3)} \quad (2)$$

5. (a) Factorise fully $18e^3f + 45e^2f^4$

$$\begin{array}{c} \nearrow \div 2 \quad \searrow \div 9 \\ 9e^2f(2e + 5f^3) \end{array}$$

$$\underline{9e^2f(2e + 5f^3)} \quad (2)$$

Task 3**SAMs Paper 1F q21b / Paper 3H q6b**

Student attempt A

- (b) Solve $x^2 - 4x - 12 = 0$
Show clear algebraic working.

$$x^2 - 4x = 0 + 12$$

$$x^2 - x = \frac{12}{4}$$

$$x - x = \sqrt{\frac{12}{4}}$$

$$x = \sqrt{\frac{12}{4}}$$

$$\sqrt{\frac{12}{4}}$$

(3)

(Total for Question 5 is 5 marks)

Student attempt B

- (b) Solve $x^2 - 4x - 12 = 0$
Show clear algebraic working.
 $a = 1$ $b = -4$ $c = -12$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{4 \pm \sqrt{16 - 4(1)(-12)}}{2}$$

$$\frac{4 \pm \sqrt{-32}}{2}$$

(3)

(Total for Question 5 is 5 marks)

Student attempt C

- (b) Solve $x^2 - 4x - 12 = 0$
Show clear algebraic working.

$$(x - 6)(x + 2)$$

$$(x - 6)(x + 2) \dots\dots\dots (3)$$

(Total for Question 5 is 5 marks)

Task 4**SAMs Paper 1F q25 / Paper 3H q10**

Student attempt A

 $AB = 7.6 \text{ cm}$ and $AC = 9.5 \text{ cm}$.

Calculate the area of the shape.

Give your answer correct to 3 significant figures.

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 7.6^2 + b^2 &= 9.5^2 \\ 57.76 + b^2 &= 90.25 \\ b^2 &= 90.25 - 57.76 \\ b^2 &= 32.49 \\ b &= \sqrt{32.49} \\ b &= 5.7 \end{aligned}$$

12.8..... cm^2

(Total for Question 10 is 5 marks)

Student attempt B

Give your answer correct to 3 significant figures.

Pythag. equ. $\rightarrow a^2 = b^2 + c^2$

$$c^2 - b^2 = a^2$$

$$\sqrt{c^2 - b^2} = a$$

$$\sqrt{9.5^2 - 7.6^2} = a$$

$$a = 5.7 \text{ cm}$$

$$BC = 5.7 \text{ cm}$$

$$\frac{5.7}{2} = 2.85$$

$$\pi r^2$$

$$\pi \times (2.85)^2 = 25.517586$$

Area of Semi circle = 25.517586

Area of triangle = $\frac{5.7 \times 7.6}{2} = 21.66$ +

$$21.66 + 25.517586$$

47.2cm²

(Total for Question 10 is 5 marks)

Student attempt C

$AB = 7.6$ cm and $AC = 9.5$ cm.

Calculate the area of the shape.

Give your answer correct to 3 significant figures.

$$9.5^2 - 7.6^2 = 12$$

$$90.25 - 57.76 = 32.49$$

$$\sqrt{32.49} = \boxed{5.7}$$

$$\begin{aligned} \text{Area of circle} &= \pi r^2 \\ &= 5.7^2 \pi = 56.25674504 \end{aligned}$$

$$\text{or } \boxed{56.3}$$

Area of triangle $\frac{1}{2} b \times h$

$$= \frac{1}{2} 5.7 \times 9.5 = 27.075 + 56.3$$

$$\begin{array}{r} 11 \\ 27.075 + 56.3 \\ \hline 83.375 \end{array} \quad \boxed{83.4}$$

$$\boxed{83.4} \text{ cm}^2$$

(Total for Question 10 is 5 marks)

Task 5**SAMs Paper 4H q24**

Student attempt A

10. Show that $\frac{\sqrt{12}-1}{2-\sqrt{3}}$ can be written as $4+3\sqrt{3}$

Show your working clearly.

$$\frac{\sqrt{12}-1}{2-\sqrt{3}} = 4+3\sqrt{3}$$

$$\sqrt{12}-1 = 4+3\sqrt{3} \times (2-\sqrt{3})$$

$$\sqrt{12}-1 = 8-4\sqrt{3}+6\sqrt{3}-9$$

$$\sqrt{12} = -1+2\sqrt{3}$$

$$2\sqrt{3} = -1+1+2\sqrt{3}$$

$$2\sqrt{3} = 2\sqrt{3}$$

Left side = right side

$$\therefore \frac{\sqrt{12}-1}{2-\sqrt{3}} \text{ can be written as } 4+3\sqrt{3}$$

$$\begin{aligned} & \frac{\sqrt{12}-1}{2-\sqrt{3}} \\ &= \frac{2\sqrt{3}-1}{2-\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{6-1}{2-\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{\sqrt{4} \times 3 - 1}{2-\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{2\sqrt{3}-1}{2-\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{2\sqrt{3}-1}{2-\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \\ &= \frac{2\sqrt{3}-1}{2-\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \end{aligned}$$

(Total for Question 10 is 4 marks)

Student attempt B

10. Show that $\frac{\sqrt{12}-1}{2-\sqrt{3}}$ can be written as $4+3\sqrt{3}$

Show your working clearly.

$$\begin{aligned} & \frac{\sqrt{12}-1}{2-\sqrt{3}} \\ &= \frac{\sqrt{12}-1 \times (2+\sqrt{3})}{2-\sqrt{3} \times (2+\sqrt{3})} \\ &= \frac{2\sqrt{12} + \sqrt{36} - 2 - \sqrt{3}}{2^2 - 3} \end{aligned}$$

$$\begin{aligned} & \rightarrow \frac{2\sqrt{12} + \sqrt{36} - 2 + \sqrt{3}}{1} \\ &= 2\sqrt{4 \times 3} + \sqrt{12} \\ &= 2\sqrt{4 \times 3} + 6 - 2 + \sqrt{3} \\ &= 4\sqrt{3} - \sqrt{3} + 4 \\ &= 3\sqrt{3} + 4 \\ &= 4 + 3\sqrt{3} \end{aligned}$$

(Total for Question 10 is 4 marks)

Student attempt C

10. Show that $\frac{\sqrt{12}-1}{2-\sqrt{3}}$ can be written as $4+3\sqrt{3}$

Show your working clearly.

$$\frac{\sqrt{12}-1}{2-\sqrt{3}} = \frac{\sqrt{4 \times 3}-1}{2-\sqrt{3}} = \frac{2\sqrt{3}-1}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}} = \frac{3\sqrt{3}}{4-\sqrt{3}}$$

$$\begin{aligned} \cancel{(2\sqrt{3}-1)(2+\sqrt{3})} &= \cancel{4\sqrt{3}} - \cancel{2} + \cancel{2\sqrt{3}} \\ &= 2\sqrt{3} \quad (2\sqrt{3}-1)(2+\sqrt{3}) \end{aligned}$$

$$(2 - \sqrt{3})(2 + \sqrt{3}) = 4\sqrt{3} - 2 + 6 - \sqrt{3}$$

$$= 4 - \cancel{2\sqrt{3}} + \cancel{2\sqrt{3}} - \sqrt{3}$$

$$= 4 - \sqrt{3}$$

(Total for Question 1b is 4 marks)

Task 6**SAMs Paper 3H q23**

Student attempt A

1. The 4th term of an arithmetic series is 17.
The 10th term of the same arithmetic series is 35.

Find the sum of the first 50 terms of this arithmetic series.

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_{50} = 25 [2a + 49d]$$

$$S_n = a + (n-1)d$$

$$S_4 = a + 3d$$

$$17 = a + 3d$$

$$S_5 = a + 9d$$

$$35 = a + 9d$$

$$\begin{array}{r} 35 = a + 9d \\ - 17 = a + 3d \end{array}$$

$$18 = 6d$$

$$d = 3$$

$$\begin{array}{r} a = 17 - 9 \\ = 8 \end{array}$$

$$\begin{array}{r} S_{50} = 25 [16 + 147] \\ = 4075 \end{array}$$

(Total for Question 9 is 5 marks)

Student attempt B

$$\begin{array}{cccccccccccc}
 17\frac{1}{2} & 34\frac{1}{3} & 85 & -17\frac{1}{6} & & & & & & & & \\
 n_1 & n_2 & n_3 & n_4 & n_5 & n_6 & n_7 & n_8 & n_9 & n_{10} & & \\
 \swarrow & \nwarrow & \swarrow & \nwarrow & \swarrow & \nwarrow & \swarrow & \nwarrow & \swarrow & \nwarrow & &
 \end{array}$$

9. The 4th term of an arithmetic series is 17.
The 10th term of the same arithmetic series is 35.

Find the sum of the first 50 terms of this arithmetic series.

$$n_4 = 17 \quad n_{10} = 35$$

$$S_n = \frac{n}{2} [2a + (n-1)d]$$

$$S_n = 25 \left[17 + (49) \times \frac{17}{6} \right]$$

$$= \underline{\underline{3895.83}}$$

$$\approx \underline{\underline{3900}}$$

$$\begin{aligned}
 n &= 50 \\
 d &= \frac{35-17}{10-4} = \frac{17}{6} \\
 a &= 8.5
 \end{aligned}$$

(Total for Question 9 is 5 marks)

Student attempt C

9. The 4th term of an arithmetic series is 17.
The 10th term of the same arithmetic series is 35.
Find the sum of the first 50 terms of this arithmetic series.

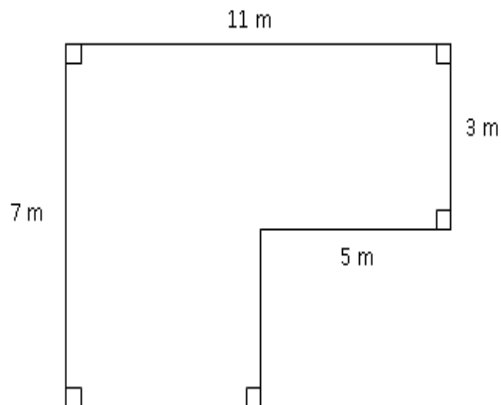
$$\begin{aligned}
 & \begin{array}{l}
 4 \rightarrow n=4 = 17 \\
 10 \rightarrow n=10 = 35
 \end{array} \\
 & 35 - 17 = 18 \div 6 = 3 \\
 & a = 5, d = 3, n = 50 \\
 & S = \frac{n}{2} \times [2a + (n-1)d] \\
 & S = \frac{50}{2} \times [2 \times 5 + (50-1) \times 3] \\
 & S = 25 \times [10 + 147] \\
 & S = 3925 //
 \end{aligned}$$

$$\begin{aligned}
 & 3, 6, 9, \dots, d=3 \\
 & 3 \times 4 = 12 \\
 & 17 - 12 = 5 \\
 & \therefore a = 5
 \end{aligned}$$

(Total for Question 9 is 5 marks)

Task 7

Construct a basic mark scheme for this question – worth 5 marks.

PROBLEM SOLVING

The diagram shows the floor plan of a room in Kate's house.

Kate is going to cover the floor with tiles. She is going to buy some packs of tiles.

The tiles in each pack of tiles cover 2 m^2 of floor. Each pack of tiles costs £24.80

Work out how much it will cost Kate to buy the packs of tiles she needs.

(5)

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Mark Scheme

SECTION B 4MB1

Task 8

SAMs Paper 1 Q26

Student Attempt A

26 (a) Use the factor theorem to show that $(2x + 3)$ is a factor of $2x^3 - 3x^2 - 17x - 12$

$$\begin{array}{r} x^2 \quad - \\ (2x+3) \overline{) 2x^3 - 3x^2 - 17x - 12} \\ \underline{2x^3 + 3x^2} \\ -6x^2 - 17x - 12 \end{array}$$

(2)

$$\begin{array}{r} 2x+3 \\ x \quad -\frac{3}{2} \\ \hline 2x = -3 \\ x = -\frac{3}{2} \end{array}$$

$$2x^3 - 3x^2 - 17x - 12 = 0$$

$$2\left(-\frac{3}{2}\right)^3 - 3\left(-\frac{3}{2}\right)^2 - 17\left(-\frac{3}{2}\right) - 12 = 0$$

$$2\left(-\frac{27}{8}\right) - 3\left(\frac{9}{4}\right) + \frac{51}{2} - 12 = 0$$

$$\therefore -\frac{27}{4} - \frac{27}{4} + \frac{51}{2} - 12 = 0$$

(b) Hence, factorise completely $2x^3 - 3x^2 - 17x - 12$

$$\begin{array}{r} 2 \quad -3 \quad -17 \quad -12 \quad | \quad -\frac{3}{2} \\ \hline \quad -3 \quad 9 \quad 12 \\ \hline 2 \quad -6 \quad -8 \quad 0 \end{array}$$

$$\begin{array}{r} 2x \quad 2x \quad -8x \\ x \quad -4x \quad 2x \\ \hline 2x^2 - 8x \quad | \quad -6x \end{array}$$

$$2(x+1)(2x+3)(x-4) = 0$$

(4)

$$2x^3 - 3x^2 - 17x - 12 = (2x+3)(2x^2 - 6x - 8) = 0$$

$$(2x+3)(2x+2)(x-4) = 0$$

$$(2x+3)(x-4)2(x+1) = 0$$

(Total for Question 26 is 6 marks)

Student attempt B

26 (a) Use the factor theorem to show that $(2x+3)$ is a factor of $2x^3-3x^2-17x-12$

(2)

$$\begin{array}{r}
 \cancel{(2x+3)} \quad 2x+3 \quad 2x^3 - 3x^2 - 17x - 12 \quad (x^2 - 3x - 4) \\
 \underline{(-) 2x^3 + 3x^2} \\
 -6x^2 - 17x - 12 \\
 \underline{(-) 6x^2 + 9x} \\
 -8x - 12 \\
 \underline{(-) 8x + 12} \\
 0
 \end{array}$$

(b) Hence, factorise completely $2x^3-3x^2-17x-12$

$$\begin{aligned}
 & 2x^3 - 3x^2 - 17x - 12 \\
 &= (x^2 - 3x - 4)(2x + 3) \\
 &= (x - 4)(x + 1)(2x + 3) \\
 & (x - 4)(x + 1)(2x + 3)
 \end{aligned}$$

Student attempt C

26 (a) Use the factor theorem to show that $(2x+3)$ is a factor of $2x^3-3x^2-17x-12$

$x = -\frac{3}{2}$

$$\begin{aligned}
 f\left(-\frac{3}{2}\right) &= 2\left(-\frac{3}{2}\right)^3 - 3\left(-\frac{3}{2}\right)^2 - 17\left(-\frac{3}{2}\right) - 12 \\
 &= 0
 \end{aligned}$$

(2)

(b) Hence, factorise completely $2x^3-3x^2-17x-12$

$$\begin{array}{r}
 2x+3 \quad 2x^3 - 3x^2 - 17x - 12 \quad (x^2 - 3x - 4) \\
 \underline{2x^3 + 3x^2} \\
 -6x^2 - 17x - 12 \\
 \underline{-6x^2 - 9x} \\
 -8x - 12 \\
 \underline{-8x - 12} \\
 0
 \end{array}$$

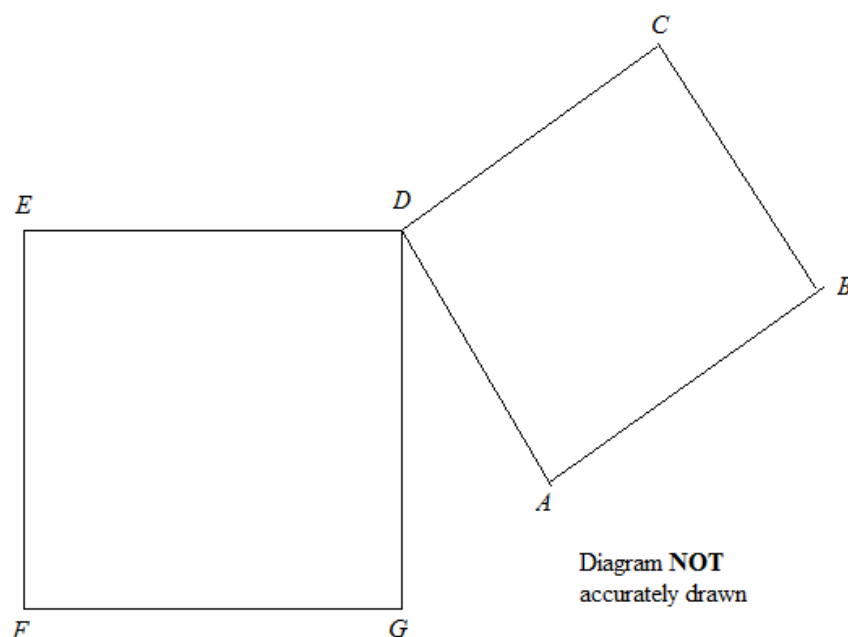
$(x+1)(x-4)$

(4)

$$\begin{aligned}
 & (x^2 - 3x - 4) \\
 &= x^2 - 4x + x - 4 \\
 &= x(x-4) + 1(x-4) \\
 &= (x+1)(x-4)
 \end{aligned}$$

Task 10**MATHEMATICAL REASONING**

Construct a basic mark scheme for this question – worth 4 marks.



$ABCD$ and $DEFG$ are squares that are not identical.

Prove that $AE = CG$

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Mark Scheme
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